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# **Perchlorate Contamination At and Near the Santa Susana Field Lab (SSFL)**

**a presentation to the  
SSFL InterAgency Work Group  
February 5, 2003**

**by**

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## SUMMARY

The Key Question: Is the off-site perchlorate contamination coming from Rocketdyne?

**Based on the available data, there are no supporting data for concluding the source of perchlorate is anywhere else but the SSFL.**

1. The available hydrogeologic data indicate that contaminated surface runoff from SSFL transported the perchlorate to Simi Valley, contaminating groundwater.
2. The available data point to groundwater transport of perchlorate to Ahmanson.
3. Other than Rocketdyne, no known perchlorate users have been identified in the area. Rocketdyne has significant perchlorate contamination.
4. New data show that perchlorate has migrated off the Rocketdyne site through contaminated surface water discharges as recently last year.

## IN CONCLUSION:

- WE MUST UNDERTAKE FURTHER MEASUREMENTS AND CONTINUE OUR RESEARCH TO BETTER UNDERSTAND THE HYDROGEOLOGY OF THE AREA (e.g., Stream/creek/canyon losses and gains, location of seeps and springs, hydraulics and occurrence of perchlorate in the unsaturated zone

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BE THE LEADING EDGE OF OTHER

MAY THUS BE INTERPRETED AS “THE CANARY IN THE MINE.”

# **Discussion**

**THE QUESTION IS:**

**Is the perchlorate in the soils and waters of southeast Ventura County (SSFL, Simi Valley and Ahmanson Ranch) from a common source?**

**PERCHLORATE USAGE/DISPOSAL IN SOUTHEAST VENTURA COUNTY (SIMI VALLEY, AHMANSON RANCH, AND SSFL):**

**SO FAR, NO KNOWN/DOCUMENTED CASES OF HISTORICAL USAGE AND DISPOSAL OF PERCHLORATE AND PERCHLORATE COMPOUNDS IN THE SIMI VALLEY AND AHMANSON RANCH**

**PERCHLORATE USER IN THE AREA HAS BEEN ROCKETDYNE.**

## **SANTA SUSANA FIELD LAB. (SSFL)**

Perchlorate and perchlorate compounds have been used and disposed of at SSFL.

Through soil and water sampling, perchlorate (perchlorate compounds?) has been found in soils, surface waters (including waters of local canyons) and groundwater resources of SSFL.

Concentrations of perchlorate in groundwater samples of SSFL ranges from ND to 670 ppb.

SSFL is composed of mostly fractured rocks (Chatsworth Formation).

SSFL is considered a groundwater recharge area.

SSFL Groundwater has a tendency (potential) to move downwards and sideways towards the Simi Valley Floor, Chatsworth Reservoir, and in the direction of Ahmanson Ranch (southerly direction).

# **Potential means/ways by which perchlorate/perchlorate compounds? From SSFL may reach/may have reached other areas:**

## **1- Transported by humans**

## **2- Atmospheric circulation**

- Via particulates (soil erosion by wind)
- Plumes from burning solid rocket fuels DRE ?
- Via water vapor ?

## **3- Groundwater**

- Groundwater elevations (potentials) at SSFL are variable but are higher than groundwater levels of Simi Valley floor, Chatsworth Reservoir area and Ahmanson Ranch area by at least several hundred feet.
- Groundwater flows from high potential (elevation) areas (SSFL) towards low potential areas (e.g., Simi Valley Floor)
- There are indications that stream/creek/canyon waters disappear as a result of various losses (e.g., evaporation and/or stream losses to rocks and sediments).

What is the extent of stream/creek/canyon losses and gains, and to where and in which direction (s) the "lost waters" are gone/are going?

#### **4- Surface water runoff**

- Several canyons and creeks (e.g., Runkle collects runoff water (storm water runoff and wastewater overflow) generated at SSFL.
- At SSFL: "90% of the total flow is discharged via two southerly discharge points (Discharge Outfalls 001 and 002) to Bell Creek, a tributary to the Los Angeles River,....."
- At SSFL: "Flow (from the Perimeter Pond and R2-A Pond) may be released to Bell Canyon....."
- At SSFL: "Less than 10% of the site (Area IV) slopes to the northwest where rainfall runoff flows northwest via five discharge points (Discharge Outfalls 003, 004, 005, 006, and 007) leading to Meier and Runkle Canyons toward Arroyo Simi."

**Under NPDES program, the quality of surface waters, including perchlorate concentrations, have been monitored at the following locations.**

**- Outfalls 001 and 002**

At the present under NPDES permit:

"The discharges for outfalls Nos. 001 and 002 shall be limited to overflow from the reclamation water system (consisting of treated ground water, cooling water, treated domestic wastewater, storm water, and testing water) and other storm water runoff, as proposed."

**- Outfalls 003 to 007**

At the present under NPDES permit:

"Discharges from the northwest slope area (storm water conveyance) outfalls 003, 004, 005, 006, and 007 shall be limited to uncontaminated? storm water runoff only."

**- Area I Southeast Border (Happy Valley)**

**- Area I Southeast Drainage**

# **Perchlorate Data**

## **NPDES Permit CA0001309**

(Source: RWQCB files)

(Note: The following list may not be complete and samples with reported ND concentrations are not compiled here)

### **Area I Southeast Border (Happy Valley)**

| <b><u>Date</u></b> | <b><u>Rainfall (in)</u></b> | <b><u>Perchlorate (ppb)</u></b> | <b><u>Detection Limit</u></b> |
|--------------------|-----------------------------|---------------------------------|-------------------------------|
| 3/9/2001           | 0.00                        | 4.8                             | 4                             |
| 3/8/2001           | 0.00                        | 5.2                             | 4                             |
| 3/7/2001           | 0.00                        | 4.9                             | 4                             |
| 3/5/2001           | 1.70                        | 5.3                             | 4                             |
| 2/26/2001          | 0.60                        | 4.2                             | 4                             |
| 2/13/2001          | 1.38                        | 5.5                             | 4                             |
| 1/12/2001          | 0.61                        | 8                               | 4                             |
| 4/18/2000          |                             | 9.4                             |                               |
| 3/11/2000          | 0.00                        | 8.2                             | 4                             |
| 3/10/2000          |                             | <8                              |                               |
| 3/9/2000           | 0.00                        | 17                              | 4                             |
| 3/5/2000           | 1.16                        | 13                              | 4                             |
| 2/23/2000          | 1.48                        | 16                              | 4                             |

### **Area I Southeast Drainage**

|           |      |    |   |
|-----------|------|----|---|
| 3/25/1998 | 2.45 | 20 | ? |
|-----------|------|----|---|

## Outfall 001

### **May 1999:**

"Although Perimeter Pond was flowing, there was not sufficient flow to reach the routine sampling point for Outfall 001 (the flume near the property line) so samples were collected at the weir instead. The weir is located approximately one mile upstream of the flume." (RWQCB files)

What is the extent of stream/creek/canyon losses and gains in the area?

### Outfall 002 (R2A Flume)

| <u>Date</u> | <u>Rainfall(in)</u> | <u>Perchlorate(ppb)</u> | <u>Detection Limit</u> |
|-------------|---------------------|-------------------------|------------------------|
| 4/12/2000   |                     | <8                      | 4?                     |
| 9/9/1999    |                     | <8                      | 4                      |
| 4/6/1998    | 0.01                | <0.7                    | 0.6                    |
| 3/25/1998   | 2.45                | <0.7                    | 0.6                    |
| 2/6/1998    | 2.58                | <0.7                    | 0.6                    |
| 2/16/1998   | 0.28                | <0.7                    | 0.6                    |
| 2/24/1998   |                     | <0.7                    | 0.6                    |
| 2/25/1998   |                     | <0.7                    | 0.6                    |

"....water is currently (1998) discharged continuously from R-2 reclamation pond to Outfall 002. However, during hot weather, the discharged water either evaporates or saturates into the ground before reaching Outfall 002 resulting in an intermittent flow."

What is the extent of stream/creek/canyon losses and gains in the area? Are there similar losses in other areas?

**Outfall 003 (RMHF)**

|          |      |      |    |
|----------|------|------|----|
| 3/8/2000 | 0.64 | <500 | 4? |
|----------|------|------|----|

**Outfall 004 (SRE)**

|          |      |      |   |
|----------|------|------|---|
| 3/8/2000 | 0.64 | <500 | 4 |
|----------|------|------|---|

**Outfall 006 (FSDF2,SBP2)**

|          |      |      |           |
|----------|------|------|-----------|
| 3/8/2000 | 0.64 | <500 | 4?        |
| 5/5/1998 | 0.92 | 4.26 | 4 or 0.7? |

**Outfall 007 (T/100)**

|          |      |      |   |
|----------|------|------|---|
| 3/8/2000 | 0.64 | <500 | 4 |
|----------|------|------|---|

## **PROPOSED MODEL FOR AHMANSON RANCH:**

(How did perchlorate enter Ahmanson Ranch?)

### **GENERAL INFORMATION:**

- The tested well (T1N/R17W-07D1S) for perchlorate on Ahmanson Ranch is located about 2 Miles South of SSFL (possibly north of the syncline axis?).
- Groundwater level and Land Surface elevation at the well: At least several hundred feet lower than SSFL.
- Total well depth: 1945 feet
- Constructed in 1967
  
- Through a video survey of the well (July 1989), it has been stated that: "visibility was poor below a depth of 317 feet, becoming better below a depth of 680 feet. Below this depth,.....**fluid could be observed entering the well at several locations.**"
  
- Perchlorate concentrations at Ahmanson Ranch:  
**The water sample was collected in Summer 2002, Concentration: 28 ppb.**
  
- The medium through which groundwater flows is mostly composed of fractured rocks including ".... few layers of hard, yellow weathering calcareous concretions or lenses."
  
- Groundwater elevations at SSFL are at least a few

hundred feet higher than Bell Creek bed (lower portions) elevations and groundwater elevation at the tested well on Ahmanson ranch.

## **POTENTIAL PATHS/SOURCES:**

**Runoff water from SSFL to Ahmanson Ranch**

(impossible, the tested well is located in Las Virgenes drainage basin.)

**Atmospheric circulation (wind) and wind erosion**

-Detailed soil, surface water, groundwater (both the saturated and the unsaturated zones) sampling and analysis for perchlorate are required.

**Groundwater (SSFL)→seeps and springs at Ahmanson Ranch→groundwaters of Ahmanson Ranch.**

(Potentially possible)

**Surface runoff (SSFL), storm water (SSFL), and/or seeps and springs (SSFL)→to local canyons and creeks including Bell Creek (onsite/offsite)→area's water resources including groundwater reservoirs of Ahmanson Ranch.**

(Potentially possible)

**Groundwater(SSFL)→Groundwaters of Ahmanson Ranch**

(Available data supports this model.)

## **PROPOSED MODELS FOR SIMI VALLEY AREA:**

(How did perchlorate enter Simi Valley?)

### **GENERAL INFORMATION:**

- Perchlorate concentrations: ND to 19.28 ppb.
- The medium through which groundwater flows is composed of fractured rocks and sediments.
- Groundwater elevations at SSFL and Simi Valley: Highly variable, but groundwater elevations (potentials) of Simi Valley are at least several hundred feet lower than SSFL's groundwater levels.
- "Less than 10% of the site (SSFL) slopes to the northwest where rainfall runoff flows northwest..." entering canyons such as Runkle and Meier and ultimately to Arroyo Simi.
- Through the NPDES program, the quality of waters (including, for the last few years, perchlorate concentrations) leaving SSFL towards Simi Valley has been monitored.

## **POTENTIAL PATHS/SOURCES:**

**Transported by humans and/or atmospheric circulation and wind erosion:**

-Detailed soil, surface water, groundwater (both the saturated and the unsaturated zones) sampling and analysis for perchlorate are required.

**Groundwater (onsite) → seeps and springs (on- and/or offsite) → runoff (on- and/or offsite) → groundwaters of Simi Valley**

(potentially possible)

**Groundwater (onsite) → groundwaters of Simi Valley**

(potentially possible)

**Surface water (surface runoff, storm water) (onsite) → released episodically with low perchlorate concentrations to local creeks and canyons (e.g., Runkle and Meier canyons) (on- and offsite) → Arroyo Simi (Line Source) (offsite) → Simi's groundwater reservoir (offsite).**

(Available data supports this model.)

## IN CONCLUSION:

- BASED ON THE AVAILABLE DATA, THERE ARE NO SUPPORTING DATA FOR CONCLUDING THE SOURCE OF PERCHLORATE IS ANYWHERE ELSE BUT THE SSFL.
- MORE MEASUREMENTS AND RESEARCH SHOULD BE CONDUCTED TO BETTER

AND IMPLICATIONS.

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BE THE LEADING EDGE OF OTHER POLLUTANT MIGRATION. THE OCCURRENCE OF PERCHLORATE IN THE AHMANSON RANCH AND SIMI VALLEY AREA MAY THUS BE INTERPRETED AS "THE CANARY IN THE MINE."



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Subject: Dr. Tabidian's presentation materials

Dr. Tabidian has asked me to forward the attached presentation materials for  
the upcoming Work Group meeting



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